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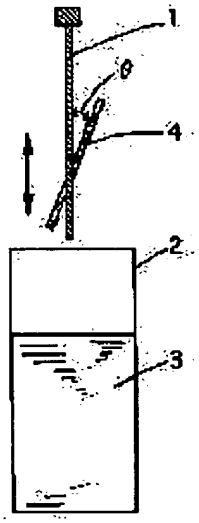
(54) METHOD FOR PLATING THROUGH HOLE FOR PRINTED WIRING BOARD

(57)Abstract:

PROBLEM TO BE SOLVED: To reduce the lack of plating in the through holes of a printed wiring board by supplying a sheet-like object to be worked in a non-vertical direction to the liquid face of treating liquid in which the object is dipped.

SOLUTION: A glass epoxy copper-clad laminate is etched, a circuit pattern is formed, 100 through holes are drilled and the material 4 to be worked is fabricated. The material 4 to be worked is dipped into a plating both 2 at an angle of 10 degrees-60 degrees from the vertical direction to the face of treating liquid 3 in a state where it is held by a hanger 1. Then, it is pre-treated by an ordinary method, electroless plating is executed while applying a current, and copper-surface plating is executed. Thus, foreign matters and bubbles, which remain in the through holes, can easily be discharged and the lack of plating in the through holes can be prevented.



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DERWENT-ACC-NO: 1998-353860

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TITLE: Through hole plating method for printed circuit - involves inserting through holes drilled printed circuit which is inclined at predetermined angle with liquid level into treatment tank

PATENT-ASSIGNEE: MATSUSHITA ELECTRIC WORKS LTD[MATW]

PRIORITY-DATA: 1996JP-0285675 (October 28, 1996)

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ABSTRACTED-PUB-NO: JP 10135631A

BASIC-ABSTRACT:

The method involves inserting printed circuit (4) with through holes into a treatment tank (2). The printed circuit is inclined at a predetermined angle to the processing liquid in the tank. The insertion speed of the printed circuit is maintained between 0.2-1m/sec.

ADVANTAGE - Prevents peeling off of plating in through hole. Facilitates discharge of foreign material and air bubbles in through hole.

CHOSEN-DRAWING: Dwg.1/1

TITLE-TERMS: THROUGH HOLE PLATE METHOD PRINT CIRCUIT INSERT THROUGH HOLE DRILL PRINT CIRCUIT INCLINE PREDETERMINED ANGLE LIQUID LEVEL TREAT TANK

DERWENT-CLASS: L03 M13 V04

CPI-CODES: L03-H04E2; M13-H;

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CPI Secondary Accession Numbers: C1998-108852
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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The SURUHORU plating approach of the printed wired board which is characterized by throwing a workpiece-ed into a non-perpendicular to the oil level of processing liquid in being immersed into processing liquid and plating the tabular workpiece-ed which has SURUHORU in the manufacture approach of a printed wired board.
[Claim 2] The SURUHORU plating approach of the printed wired board characterized by the injection include angle which throws the workpiece-ed of the claim 1 above-mentioned publication into a non-perpendicular to the oil level of processing liquid having the include angle of 10 degrees or more and 60 degrees or less from a vertical position.
[Claim 3] The SURUHORU plating approach of the printed wired board characterized by the injection rates which feed above-mentioned claim 1 and a workpiece-ed according to claim 2 into processing liquid being 0.2 or more m/sec and 1 m/sec or less

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the SURUHORU plating approach which forms plating in SURUHORU certainly in the manufacture approach of a printed wired board.
[0002]
[Description of the Prior Art] In recent years, for those with a demand, such as a miniaturization, lightweight-izing, highly-precise-izing, and multi-functionalization, and implementation of those, the circuit pattern of a printed wired board also becomes complicated, and, as for the trend of an electron and an electrical machinery and apparatus, the printed wired board of high density and the Kota layer is called for increasingly. And much SURUHORU has come to be formed in this printed wired board while a circuit pattern becomes high density.
[0003] In order to aim at a flow, after this SURUHORU pretreats with a conventional method, it is common to perform electroless deposition and to perform electrolytic copper plating or sulfuric-acid electrolytic copper plating.
[0004] And the approach perpendicularly immersed to the oil level of processing liquid in a tabular workpiece-ed is taken, and the above-mentioned plating approach rocks a workpiece-ed up and down, and it makes processing liquid produce a turbulent flow, and he is trying to form a plating coat in homogeneity further.
[0005] However, although the plating coat could be formed in homogeneity by the above-mentioned plating approach at the circuit pattern formed in the front face at the printed wired board, the plating omission might be produced in the wall of SURUHORU. In case the plating omission of the wall of this SURUHORU plates, in order that air bubbles may remain in SURUHORU and it may bar contact in a wall surface and plating liquid, a plating coat is no longer formed in that part. If this plating omission arises, it will become impossible to aim at the flow of SURUHORU, and the defective continuity of a printed wired board will occur.
[0006]
[Problem(s) to be Solved by the Invention] It is offering the SURUHORU plating approach which this invention's can be made in view of the above situations, and the place made into the purpose can mitigate the plating omission of SURUHORU of a printed wired board, and can form a plating coat uniformly.
[0007]
[Means for Solving the Problem] In being immersed into processing liquid and plating the tabular workpiece-ed which has SURUHORU, the SURUHORU plating approach of the printed wired board concerning claim 1 of this invention is characterized by throwing a workpiece-ed into a non-perpendicular to the oil level of processing liquid in the manufacture approach of a printed wired board.
[0008] The SURUHORU plating approach of the printed wired board concerning claim 2 of this invention is characterized by the injection include angle which throws the workpiece-ed of the claim 1 above-mentioned publication into a non-perpendicular to the oil level of processing liquid having the

include angle of 10 degrees or more and 60 degrees or less from a vertical position.
[0009] The SURUHORU plating approach of the printed wired board concerning claim 3 of this invention is characterized by the injection rates which feed above-mentioned claim 1 and a workpiece-ed according to claim 2 into processing liquid being 0.2 or more m/sec and 1 m/sec or less.
[0010] Before performing non-electrolytic copper plating, the head end process consists of plating down stream processing of a printed wired board. In this head end process, in order to remove the foreign matter and fat which adhered on the surface of copper foil, pickling and software etching processing are performed. Furthermore, with this pretreatment, discharge of the foreign matter which remains inside the through tube which forms SURUHORU is also performed to coincidence.
[0011] By the SURUHORU plating approach of the printed wired board of this invention, it is characterized by limiting the conditions which throw a workpiece-ed into pretreatment for performing the conditions and plating processing which feed a workpiece-ed into the plating processing liquid which performs plating processing.
[0012] That by which the tabular workpiece-ed which has SURUHORU which is the object of this invention formed the circuit pattern in copper clad laminate, and well-known printed wired board ingredients, such as a ceramic substrate, are mentioned.
[0013] In being immersed into processing liquid and plating this ********-ed, a workpiece-ed is thrown into a non-perpendicular to the oil level of processing liquid, and these injection include angles are 10 degrees or more and 60 degrees or less in include angle from a vertical position. It becomes being the same as that of the case where this injection include angle supplies at right angles to being less than 10 degrees, and in case it supplies, it becomes impossible for the drift velocity of the processing liquid which flows into SURUHORU to obtain, but to discharge the foreign matter and air bubbles which remain in SURUHORU. moreover, if an injection include angle comes to be alike more greatly than 60 degrees, since the drag force produced in the oil level at the time of supplying to processing liquid becomes large, curvature and torsion will arise in a workpiece-ed.
[0014] It becomes impossible moreover, for the drift velocity of the processing liquid which flows into SURUHORU to obtain it, in case the injection rate supplied to processing liquid supplies that it is 0.2 or more m/sec and 1 m/sec or less, and they are less than 0.2 m/sec like the time when the above-mentioned injection include angle is small, but to discharge the foreign matter and air bubbles which remain in SURUHORU. Moreover, if an injection rate becomes larger than 1 m/sec, since the drag force produced in the oil level at the time of supplying to processing liquid becomes large, curvature and torsion will arise in a workpiece-ed.
[0015] Since the workpiece-ed immersed in the processing tub circulates also through the processing liquid inside SURUHORU while nearby processing liquid convects by making it rock further up and down, it is stabilized more and can form a plating coat.
[0016]
[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained, referring to a drawing.
[0017] Drawing 1 is the processor of the SURUHORU plating approach which shows 1 operation gestalt of this invention. The above-mentioned plating processor consists of a hanger 1 which pinches the printed wired board which is the workpiece 4-ed, and two or more processing tubs 2, and illustrated one set of the processing tub 2 with which processing liquid 3 was filled in drawing 1 .
[0018] First, glass epoxy copper clad laminate with a thickness of 3mm was etched, the circuit pattern was formed, and further, the diameter formed 1000 through tubes with the drill which is 0.3mm, and formed the workpiece-ed.
[0019] And after making the above-mentioned workpiece-ed immersed in a plating bath in the condition of having pinched on the hanger from the perpendicular direction at the include angle shown in Table 1, respectively and pretreating it with a conventional method to a processing oil level, copper-sulfate plating was performed, energizing by performing electroless deposition.
[0020] The result of having measured the number of plating omissions in SURUHORU of each workpiece-ed which performed the above-mentioned plating processing, and the plating thickness of a

SURUHORU wall is shown in Table 1.

[0021]

[Table 1]

	実施例1	実施例2	実施例3	比較例1
投入角度θ	30	30	50	90
投入速度（m/sec）	0.3	0.5	0.3	0.3
スルホールメッキ抜け数	0	0	0	3
スルホール内メッキ厚（μm）	9	8	9	6

[0022] However, the plating thickness formed in the front face of the circuit pattern of the front face of the above-mentioned workpiece-ed was 10**0.2 micrometers.

[0023] As shown in the above-mentioned table 1, the foreign matter and air bubbles which remain in SURUHORU by controlling the include angle which the workpiece-ed fed into plating processing liquid supplies, and the rate to supply according to the SURUHORU plating approach of this invention can be discharged, and generating of the plating omission in SURUHORU can be prevented. Furthermore, processing liquid can flow easily in SURUHORU.

[0024]

[Effect of the Invention] According to the SURUHORU plating approach of the printed wired board of this invention, by making into 0.2 or more m/sec and 1 m/sec or less the injection rate which throws in a workpiece-ed from a non-perpendicular and a vertical position to the oil level of processing liquid at the include angle of 10 degrees or more and 60 degrees or less, in addition is supplied to processing liquid, the foreign matter and air bubbles which remain in SURUHORU can be discharged easily, and generating of the plating omission in SURUHORU can be prevented. Furthermore, since processing liquid can flow easily in SURUHORU, circulation of the processing liquid in SURUHORU becomes efficient, and can thicken plating thickness in SURUHORU.

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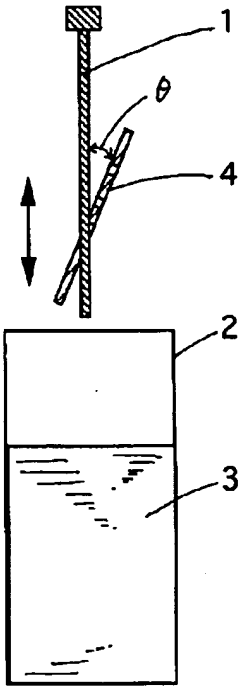
(54)【発明の名称】　プリント配線板のスルホールメッキ方法

(57)【要約】
【課題】　プリント配線板のスルホールのメッキ抜けを軽減し、メッキ皮膜を一定に形成することができるスルホールメッキ方法を提供することである。
【解決手段】　本発明のプリント配線板のスルホールメッキ方法は、プリント配線板の製造方法において、スルホールを有する板状の被加工品を処理液中に浸漬してメッキするに当たり、被加工品を処理液の液面に対し非垂直に投入することを特徴とする。



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【特許請求の範囲】
【請求項１】　プリント配線板の製造方法において、スルホールを有する板状の被加工品を処理液中に浸漬してメッキするに当たり、被加工品を処理液の液面に対し非垂直に投入することを特徴とするプリント配線板のスルホールメッキ方法。
【請求項２】　上記請求項１記載の被加工品を処理液の液面に対し非垂直に投入する投入角度が垂直位置より１０°以上、６０°以下の角度を有することを特徴とするプリント配線板のスルホールメッキ方法。
【請求項３】　上記請求項１及び請求項２記載の被加工品を処理液に投入する投入速度が０．２ｍ／ｓｅｃ以上、１ｍ／ｓｅｃ以下であることを特徴とするプリント配線板のスルホールメッキ方法
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、プリント配線板の製造方法において、スルホール内のメッキを確実に形成するスルホールメッキ方法に関するものである。
【０００２】
【従来の技術】近年、電子、電気機器の動向は小型化、軽量化、高精度化、多機能化等の要求あり、その実現のために、プリント配線板の回路パターンも複雑になり、高密度、高多層のプリント配線板が求められるようになってきている。そして、該プリント配線板には、回路パターンが高密度になるとともに、多数のスルホールが形成されるようになってきた。
【０００３】このスルホールは導通を図るために、常法により前処理を行った後、無電解メッキを行って電解銅メッキ、又は硫酸電解銅メッキを行うのが一般的である。
【０００４】そして、上記メッキ方法は、板状の被加工品を処理液の液面に対し、垂直に浸漬する方法がとられ、上下に被加工品を揺動し、さらに、処理液に乱流を生じさせて、メッキ皮膜を均一に形成するようにしている。
【０００５】しかしながら、上記メッキ方法では、プリント配線板に表面に形成された回路パターンには均一にメッキ皮膜を形成することができるが、スルホールの内壁にメッキ抜けを生じることがあった。このスルホールの内壁のメッキ抜けは、メッキする際にスルホール内に気泡が残留し、壁面とメッキ液との接触を妨げるためその箇所にメッキ皮膜が形成されなくなるのである。このメッキ抜けが生じるとスルホールの導通が図れなくなり、プリント配線板の導通不良が発生する。
【０００６】
【発明が解決しようとする課題】本発明は、上記のような事情に鑑みてなされたものであって、その目的とするところは、プリント配線板のスルホールのメッキ抜けを軽減し、メッキ皮膜を一定に形成することができるスルホールメッキ方法を提供することである。

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【０００７】
【課題を解決するための手段】本発明の請求項１に係るプリント配線板のスルホールメッキ方法は、プリント配線板の製造方法において、スルホールを有する板状の被加工品を処理液中に浸漬してメッキするに当たり、被加工品を処理液の液面に対し非垂直に投入することを特徴とする。
【０００８】本発明の請求項２に係るプリント配線板のスルホールメッキ方法は、上記請求項１記載の被加工品を処理液の液面に対し非垂直に投入する投入角度が垂直位置より１０°以上、６０°以下の角度を有することを特徴とする。
【０００９】本発明の請求項３に係るプリント配線板のスルホールメッキ方法は、上記請求項１及び請求項２記載の被加工品を処理液に投入する投入速度が０．２ｍ／ｓｅｃ以上、１ｍ／ｓｅｃ以下であることを特徴とする。
【００１０】プリント配線板のメッキ処理工程では、無電解銅メッキを施す前に前処理工程が構成されている。この前処理工程では、銅箔の表面に付着した異物や脂肪を除去するために酸洗いやソフトエッチング処理が施される。さらに、この前処理では、スルホールを形成する貫通孔の内部に残留する異物の排出も同時に行われている。
【００１１】本発明のプリント配線板のスルホールメッキ方法では、メッキ処理を施すメッキ処理液に被加工品を投入する条件及びメッキ処理を施すための前処理に被加工品を投入する条件を限定することを特徴とするものである。
【００１２】本発明の対象物であるスルホールを有する板状の被加工品は、例えば、銅張積層板に回路パターンを形成したものや、セラミック基板等の周知のプリント配線板材料が挙げられる。
【００１３】この被加工品をを処理液中に浸漬してメッキするに当たり、被加工品を処理液の液面に対し非垂直に投入するもので、該投入角度が垂直位置より１０°以上、６０°以下の角度である。この投入角度が１０°未満であると垂直に投入した場合と同様になり、投入する際にスルホールに流れ込む処理液の流動速度が得ることができず、スルホール内に残留する異物、気泡を排出することができなくなる。また、投入角度が６０°より大きくになると、処理液に投入する際の液面で生じる抵抗力が大きくなるため被加工品に反りやねじれが生じる。
【００１４】また、処理液に投入する投入速度は、０．２ｍ／ｓｅｃ以上、１ｍ／ｓｅｃ以下で、０．２ｍ／ｓｅｃ未満であると、上記投入角度が小さいときと同様、投入する際にスルホールに流れ込む処理液の流動速度が得ることができず、スルホール内に残留する異物、気泡を排出することができなくなる。また、投入速度が１ｍ

／ｓｅｃより大きくなると、処理液に投入する際の液面で生じる抵抗力が大きくなるため被加工品に反りやねじれが生じる。

【００１５】処理槽に浸漬した被加工品は、さらに上下に揺動させることにより、近傍の処理液が対流するとともに、スルホールの内部の処理液も循環するので、より安定してメッキ皮膜を形成することができる。

【００１６】

【発明の実施の形態】以下、本発明の実施形態を図面を参照しながら説明する。

【００１７】図１は本発明の一実施形態を示すスルホールメッキ方法の処理装置である。上記メッキ処理装置は、被加工品４であるプリント配線板を挟持するハンガー１と、複数の処理槽２とから構成されており、図１では、処理液３が満たされた１台の処理槽２を例示した。

＊【００１８】まず、厚さ３mmのガラスエポキシ銅張積層板をエッチングして回路パターンを形成し、さらに、直径が０．３mmのドリルで貫通孔を１０００個形成し、被加工品を形成した。

【００１９】そして、上記被加工品を処理液面に対し垂直方向から、それぞれ表１に示す角度でハンガーに挟持した状態でメッキ槽内に浸漬させ、常法により前処理を行った後、無電解メッキを行って、通電しつつ硫酸銅メッキを行った。

【００２０】上記メッキ処理を行ったそれぞれの被加工品のスルホール内のメッキ抜け数とスルホール内壁のメッキ厚みとを測定した結果を表１に示す。

【００２１】

【表１】

	実施例１	実施例２	実施例３	比較例１
投入角度θ	30	30	50	90
投入速度（m/sec）	0.3	0.5	0.3	0.3
スルホールメッキ抜け数	0	0	0	3
スルホール内メッキ厚（μm）	9	8	9	6

【００２２】但し、上記被加工品の表面の回路パターンの表面に形成されたメッキ厚みは１０±０．２μｍであった。

【００２３】上記表１に示すように本発明のスルホールメッキ方法によると、メッキ処理液に投入する被加工品の投入する角度と投入する速度を制御することにより、スルホール内に残留する異物や気泡を排出することができ、スルホール内のメッキ抜けの発生を防ぐことができる。さらに、スルホール内に処理液が容易に流動することができる。

【００２４】

【発明の効果】本発明のプリント配線板のスルホールメッキ方法によると、被加工品を処理液の液面に対し非垂直、垂直位置より１０°以上、６０°以下の角度で投入し、加えて、処理液に投入する投入速度を０．２ｍ／ｓ※ｅｃ以上、１ｍ／ｓｅｃ以下にすることにより、スルホール内に残留する異物や気泡を容易に排出することができ、スルホール内のメッキ抜けの発生を防ぐことができる。さらに、スルホール内に処理液が容易に流動することができるので、スルホール内の処理液の循環が効率的になりスルホール内のメッキ厚みを厚くすることができる。

【図面の簡単な説明】

【図１】本発明の実施形態の一例を示すメッキ処理槽の説明図である。

【符号の説明】

１　ハンガー
２　処理槽
３　処理液
４　被加工品

【図1】